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| | | | 2859 | |

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|--------------------|---------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/067,429 | VISSER ET AL. | |
| | Examiner | Art Unit | |
| | Tiffany A Feltzner | 2859 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/23/2003 and RCE request 12/01/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED 1st ACTION After RCE

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/23/2003 has been entered.
2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
3. The **Previous Office action of 01/26/2003 is withdrawn**, since the amendment filed 10/23/2003 was not considered. This office action considers the amendment filed 10/23/2003 and the RCE request of December 1st 2004.

Priority

4. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

5. The proposed red-ink drawing correction to figure 1 of June 16th 2003, which labels Figure 1 as prior art is approved by the examiner

Specification

6. The objections to the disclosure from the May 2nd 2003 office action are rescinded in view of applicant's June 16th 2003 amendment.

Claim Objections

7. The objections to Finally rejected **Amended Claim 1**, and **claims 2-8** which respectively depend from Finally rejected **Amended Claim 1**, from the final September 10th 2003 office action are rescinded because applicant's after-final amendments to **claim 1** overcome the objections.

Response to Arguments

8. Applicant's arguments filed June 16th 2003 have been fully considered but they are not persuasive. Figure 5 of **Vij et al.**, shows that the signals from loops 40, 42, 44 and 46 are separately received.] **Vij et al** teaches the imaging parameters, gradient means, and excitation means of a typical axial imaging sequence generate NMR signals that are detected by the RF coils and recorded as an NMR signal. [See col. 1 lines 13-61]. **Vij et al** also teaches and shows "decoupling circuit 64" which is a functional "control unit for selectively routing at least one detected rf signal towards separate receiver channels; combining networks 82, 86 "for combining the RF signals of at least two RF coils" [See Figure 5] depending on the imaging parameters and for applying the combined RF signals to separate receiver channels, such that at least

two detected RF signals (i.e. 66, 68; or 62, 70) **can be combined to form a combined signal** (i.e. 84, or 88) **and the combined signal** (i.e. 84, or 88) **is applied to one particular receiver channel.**" [See the inputs 88 and 84 which are single

channel outputs from the combined channel inputs of combining network 82, 86; that are fed into hybrid combiner 90 to produce final output signal 92]. The examiner also notes that applicant should see Figure 5, decoupling circuit 64, combining networks 82, 86, output signals 84, 88, and hybrid combiner 90, col. 6 line 62 through col. 8 line 63.

9. With respect to applicant's June 16th 2003 argument that the quadrature signals of **Burl et al.**, are not applied to a single receiver channel. The examiner notes that col. 5 lines 38-40 specifically teach combining quadrature signals as a single channel. Therefore applicant's argument of page 9 paragraph 2 through page 10 paragraph 2 of the June 13th 2003 amendment response is not persuasive.

10. With respect to applicant's June 16th 2003 arguments that the dependent claims should be allowed because the independent claim rejections should be withdrawn, [See the June 13th 2003 amendment response page 10 paragraph 3 through page 11 paragraph 2] the examiner is not persuaded.

11. Applicant's After-final arguments filed October 23rd 2003, and the amendment of October 23rd 2003, which were entered with the RCE request of 12/01/2003 have been fully considered but they are not persuasive, because an updated search on the amended after-final claims, which are now under an RCE first action rejection, provides additional prior art which meets the requirements of the currently pending claims. The examiner also notes that the originally applied art, has not yet been overcome by

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applicant, because the initially applied art has structural components / method steps which still read on / meet the after-final amended claims.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

13. **Amended Claims 1, 7, 9** are rejected under **35 U.S.C. 102(b)** as being anticipated by **Vij et al.**, US patent 5,370,118.

14. With respect to **Amended Claim 1**, and corresponding **Amended method claim 9**, **Vij et al.**, teaches and shows "A magnetic resonance imaging apparatus / method comprising: an RF coil system comprising at least two sets of at least two RF coils **which detects** [~~for detecting~~] RF signals from a region of interest," [See abstract, Figure 5, col. 4 lines 7-25] "at least two receiver channels **which receive and process** [~~for receiving and processing~~] the detected RF signals," [See Figure 5, which suggests at least four channels (i.e. 62, 70; 66, 68) "and a "control unit" [See Decoupling circuit 64 taught in col. 7 lines 43-54 to include a diode that may be forward biased by an independent source of DC power to allow a current to flow across capacitor 50. Because the conditions of forward biasing control when each of the four coils (i.e. 40,

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42, 44, 46) are active, decoupling circuit 64 is a control unit "[for] which controls at least one switch (i.e. diode network 52) that selectively routes [routing] at least one detected rf signal towards separate receiver channels" as amended by applicant. **Vij et al.**, also teaches and shows combining networks 82, 86 "said at least one RF signal is combined with an [for combining the] RF signal [signals] of at least two RF coils" [See Figure 5] depending on the imaging parameters, said control unit (i.e combining network 82, 86) applies [and for applying] "the combined RF signals to separate receiver channels, such that at least two detected RF signals (i.e. 66, 68; or 62, 70) can be combined to form a combined signal (i.e. 84, or 88) and the combined signal (i.e. 84, or 88) is applied to one particular receiver channel." [See the inputs 88 and 84 which are single channel outputs from the combined channel inputs of combining network 82, 86; that are fed into hybrid combiner 90 to produce final output signal 92]. The examiner also notes that applicant should see Figure 5, decoupling circuit 64, combining networks 82, 86, output signals 84, 88, and hybrid combiner 90, col. 6 line 62 through col. 8 line 63. [See also the response to arguments given above.]

15. With respect to **Amended Claim 7** and corresponding **new method claim 15**, **Vij et al.**, teaches and shows "said control unit) (i.e. combining network 82, 86) is provided to select and/or combine the RF signals of at least two RF coils." [See Figure 5 combining networks 82, 86, and hybrid combiner 90, col. 4 lines 27-32; col. 6 line 62 through col. 8 line 63.] "is provided to select and/or combine the RF signals of at least two RF coils depending on the phase encoding direction."

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16. **Amended Claims 1-7, 9** are rejected under **35 U.S.C. 102(e)** as being anticipated by **Burl et al.**, US patent 6,377,044.

17. With respect to **Amended Claim 1**, and corresponding **amended method claim 9**, **Burl et al.**, teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects ~~[for detecting]~~ RF signals from a region of interest," [See Figure 4 where: coils 100₁, 100₂, 100₃, 100₄, comprise a first set of four coils; coils 102₁ 102₂ 102₃ 102₄ comprise a second set of four coils; or coils (100₁, and 102₁), (100₂ and 102₂), (100₃, and 102₃), and (100₄, and 102₄) comprise four sets of two coils as taught in col. 4 lines 24-49] **Burl et al.**, also teaches and shows "at least two receiver channels which receive and process ~~[for receiving and processing]~~ the detected RF signals" [See Figures 1 through 4]

18. **Burl et al.**, also teaches and shows "a control unit" [See switch assembly 40; receivers 46, 48 Figures 1-4; the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49] "~~[for]~~ which controls at least one switch (i.e. switch components 44₁, 44₂, col. 4 line 43 through col. 5 line 12) that selectively routes ~~[routing]~~ at least one detected RF signal towards separate receiver channels, said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils" [See Figures 1-4] "depending on the imaging parameters, said control unit (i.e. switch circuit 40; col. 4 line 43 through col. 5 line 12) applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, [See col. 4 lines 18-42; and col. 4 line 60 through col. 5 line 5 where the specified imaging parameters,

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controlled by sequence control processor 50, generate or initiate, the presence or absence of a DC biasing potential that controls the functional mode of the **Burl et al.**, apparatus. The biasing potential is responsible for "applying the selected and/or the combined RF signals to the separate receiver channels, such that at least two detected RF signals (i.e. the quadrature and antiquadrature signals) can be combined to form a combined signal [See col. 5 lines 20-23] and the combined signal is applied to one particular receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49, especially col. 5 lines 38 to 40 where the quadrature signals of butterfly, loop, ladder (i.e. a planar birdcage coil) are taught to be combined as a single channel and the response to arguments given above.]

19. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of several groups of at least two RF coils (i.e coils 100₁, 100₂, 100₃, 100₄, comprise a first set of four coils; coils 102₁ 102₂ 102₃ 102₄ comprise a second set of four coils; or coils (100₁, and 102₁), (100₂ and 102₂), (100₃, and 102₃), and (100₄, and 102₄) comprise four sets of two coils as taught in col. 4 lines 24-49], "into a separate receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49]

20. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Burl et al.**, teaches and shows "said RF coil system (9, 10, 11, 12) comprises two sets of four RF coils." [See Figure 4 where: coils 100₁, 100₂, 100₃, 100₄, comprise a first set of four coils; coils 102₁ 102₂ 102₃ 102₄ comprise a second set of four coils; or coils

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(100₁, and 102₁), (100₂ and 102₂), (100₃, and 102₃), and (100₄, and 102₄) comprise four sets of two coils as taught in col. 4 lines 24-49]

21. With respect to **Claim 4**, and corresponding **new method claim 12**, **Burl et al.**, teaches and shows "a birdcage head coil arrangement." [See col. 3 lines 30 through col. 4 line 17; Figure 1 component 28; col. 1 lines 33-47; and col. 5 lines 41-42 which teaches that the head piece coils, (i.e. the birdcage style head coils shown in Figure 1), can be conveyed to separate receiver channels.]

22. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See Figure 1 the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49]

23. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figure 1 the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49, especially col. 5 lines 23-42]

24. With respect to **Amended Claim 7**, and corresponding **new method claim 15**, **Burl et al.**, teaches and shows "said control unit is provided to select and/or combine the RF signals of at least two RF coils **depending** on the phase encoding direction." [See Figures 1, 2, 3, the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49]

25. With respect to **Amended Claim 9**, **Burl et al.**, teaches and shows "A magnetic resonance imaging method, comprising the steps of: detecting RF signals from a region

of interest while using an RF coil system comprising at least two sets of at least two RF coils", [See Figure 4 where: coils 100₁, 100₂, 100₃, 100₄, comprise a first set of four coils; coils 102₁ 102₂ 102₃ 102₄ comprise a second set of four coils; or coils (100₁, and 102₁), (100₂ and 102₂), (100₃, and 102₃), and (100₄, and 102₄) comprise four sets of two coils as taught in col. 4 lines 24-49] "receiving and processing the detected RF signals while using at least two receiver channels, [See Figures 1 through 4; col. 4 line 18 through col. 5 line 49] "and controlling at least one switch (i.e. switch components 44₁, 44₂, col. 4 line 43 through col. 5 line 12) that selectively routes [routing] at least one detected rf signal towards separate receiver channels for combining the RF signals of at least two RF coils" [See Figures 1-4] depending on the imaging parameters and for applying the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal (and the combined signal) is applied to one particular receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49; and the rejection reasons of amended claim 1 which need not be reiterated.]

26. **Amended Claims 1, 2, 4-6, 9, 10 and 12-14** are rejected under **35 U.S.C. 102(e)** as being anticipated by **Misic** US patent 6,356,081 B1 issued March 12th 2002, filed November 24th 1999.

27. With respect to **Amended Claim 1**, and corresponding **amended method claim 9**, **Misic** teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects [for detecting] RF signals from a region of interest," [See Figures 1, 3, 4, 5, col. 2 lines 27-

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30] **Misic** also teaches and shows "at least two receiver channels which receive and process ~~[for receiving and processing]~~ the detected RF signals" [See Figures 2a, 2b; col. 1 lines 31-35; col. 1 lines 45-51; col. 4 line 1 through col. 6 line 42 which teach many different channel / component configurations.]

28. **Misic** also teaches and shows "a control unit" [See the coil interface component 100, of the abstract, in combination with the MRI system console, and the one or more PIN diode switches and teachings of col. 1 line 30 through col. 3 line 67, especially col. 3 lines 60-67] "~~[for]~~ which controls at least one switch (i.e. the PIN diode switch components taught throughout col. 3 that selectively routes ~~[routing]~~ at least one detected rf signal towards separate receiver channels, said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils depending on the imaging parameters" [See abstract, col. 1 line 30 through col. 6 line 42] , "said control unit (i.e. the MRI console, which in combination with the coil interface 100 and the pin diodes) "applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, [See abstract, col. 1 line 30 through col. 6 line 42], "such that at least two detected RF signals can be combined to form a combined signal [See col. 2 lines 27-29; abstract; col. 3 lines 31-42; col. 4 lines 16-25; col. 6 lines 6-25] and the combined signal is applied to one particular receiver channel." [See col. 2 lines 27-29; abstract; col. 3 lines 31-42; col. 4 lines 16-25; col. 6 lines 6-25].

29. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of

several groups of at least two RF coils into a separate receiver channel." [See abstract, col. 1 line 30 through col. 6 line 42]

30. With respect to **Amended Claim 4**, and corresponding **new method claim 12**, **Misic** teaches and shows "a birdcage head coil arrangement." [See Figures 1, 3, 4, 5, col. 2 lines 14-26; col. 3 lines 7-59 birdcage component 60.]

31. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See Figures 1, 3, 4, 5, column 3 and col. 6 lines 17-42.]

32. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figures 2a, 2b; abstract, col. 1 line 30 through col. 6 line 42.]

Claim Rejections - 35 USC § 103

33. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

34. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

35. **Amended Claims 1-6, and 9-14** are rejected under **35 U.S.C. 103(a)** as being obvious over **Srinivasan et al.**, US patent 5,664,568 issued September 9th 1997.

36. With respect to **Amended Claim 1**, and corresponding **amended method claim 9, Srinivasan et al.**, teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects ~~[for detecting]~~ RF signals from a region of interest," [See Figure 10, col. 10 lines 36-68 where: coils 152a, 152b, comprise a first set of coils; and coils 154a 154b comprise a second set of coils] **Srinivasan et al.**, also teaches and shows "at least two receiver channels which receive and process ~~[for receiving and processing]~~ the detected RF signals" [See Figures 10; col. 10 lines 36-68 especially col. 10 lines 40-43] . **Srinivasan et al.**, also teaches and shows "a control unit" [See the interface taught in col. 9 lines 58 –67; and figure 1 sequence controller component 60].

37. The ability to "selectively route ~~[routing]~~ at least one detected rf signal towards separate receiver channels," with "said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils" [See Figures 1-4] "depending on the imaging parameters" is taught by **Srinivasan et al.**, in col.. 10 lines 36-68, especially col. 10 lines 40-43. **Srinivasan et al.**, also teaches that "said control unit (i.e. the interface) "applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, [See col. 9 lines 50-67; and col. 10 lines 36-68, especially col. 10 lines 40-43. where the specified imaging parameters, controlled by sequence control processor 60, generate or initiate, the presence or absence of a voltage according to

table 1 that controls the functional mode of the **Srinivasan et al.**, apparatus. The voltages are responsible for "applying the selected and/or the combined RF signals to the separate receiver channels, such that at least two detected RF signals (I.e. the signals from loop coils 152a, and 152b) can be combined to form a combined signal [See col. 10 lines 36-68,] "and the combined signal is applied to one particular receiver channel." [See col. 10 lines 36-68; Figure 10.]

38. **Srinivasan et al.**, lacks directly showing that the interface and / or the sequence controller 60 **"controls at least one switch"**. However, the examiner notes that even though this feature is not directly shown or taught that it would have been obvious to one of ordinary skill in the art at the time that the invention was made, that the ability of the interface and / or the sequence controller 60 to **":control at least one switch"** is suggested from the **Srinivasan et al.**, reference because **Srinivasan et al.**, teaches that the coil has an MR interface, with the interface having "individual channel device drivers" with the imaging modes depending on whether the individual channels are "on" or "off" [See table 1 in col. 9] because the "individual channel device drivers" are capable of being "on" or "off" the examiner is interpreting the "individual channel device drivers" of col. 9 lines 50-67 in combination with TABLE 1 to represent the presence of **at least one switch**, within the interface and/or the sequence controller 60.]

39. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Srinivasan et al.**, teaches that "said control unit is provided to combine the RF signals of several groups of at least two RF coils into a separate receiver channel." [See the

sequence control processor 60, along with the RF channel interface, and teachings of col. 9 lines 50-67; col. 10 lines 36-68; especially col. 10 lines 40-43].

40. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Srinivasan et al.**, teaches alternative embodiments which suggest that "said RF coil system may comprise two sets of four RF coils." [See col. 10 lines 36-68; col. 9 table 1 especially col. 10 lines 58-61 where **Srinivasan et al.**, teaches combining several quadrature coil pairs in a cascade manner to cover elongated anatomy under investigation.]

41. With respect to **Claim 4**, and corresponding **new method claim 12**, **Srinivasan et al.**, teaches and shows "a birdcage head coil arrangement." [See col. 9 line 35 through col. 10 line 68; Figures 1 through 6, Figures 9, 10]

42. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Srinivasan et al.**, teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See col. 6 lines 48-63 in combination with col. 10 lines 36-68, especially col. 10 lines 40-43; Figures 1 through 6, Figures 9, 10]

43. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Srinivasan et al.**, teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figure 10 and teachings of col. 10 lines 36-68]

44. **Amended Claim 3**, and **11** are rejected under **35 U.S.C. 103(a)** as being obvious over **Misic** US patent 6,356,081 B1 issued March 12th 2002, filed November 24th 1999.

45. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Misic** lacks directly teaching or showing that "said RF coil system comprises two sets of four RF coils." However, **Misic** teaches a set of four coils, multiple sets of two RF coils, and the ability to substitute one or more sets of two coils, for one or more of the initially taught RF coils. [See col. 2 line 4 through col. 6 line 42. Additionally **Misic** teaches that more or fewer elements (i.e. coils, components) may be used than are described. [See col. 6 lines 32-42.] Therefore, It would have been obvious to one of ordinary skill in the art at the time that the invention was made that the ability to modify the coil arrangement described to comprise "two sets of four RF coils", is broadly suggested from the teachings of the **Misic** reference.

46. **Amended Claim 8** is rejected under **35 U.S.C. 103(a)** as being unpatentable over **Burl et al.**, US patent 6,377,044 as applied to **Amended claims 1-7**, and **9** above, and further in view of **Pruessmann et al.**, article "SENSE: Sensitivity encoding for Fast MRI" Magnetic Resonance in Medicine 42: pages 952-962 1999.

47. With respect to **Amended Claim 8**, and corresponding **new method claim 16**, **Burl et al.**, teaches and shows "said control unit is provided to select and/or combine the RF signals of at least two RF coils" [See Figures 1 through 4; col. 4 line 18 through col. 5 line 49].

48. **Burl et al.**, lacks directly teaching that the "selection and/or combination of the RF signals of at least two RF coils is depending on the desired SENSE reduction direction." However, SENSE, a conventional MRI multi-coil encoding procedure developed originally by Pruessmann et al., in 1999, is usable with FFE (i.e. fast field

echo), TSE (i.e. turbo spin-echo), and half-Fourier EPI (i.e. echo-planar imaging) procedures, [See Pruessmann et al., page 958 col. 2 discussion paragraph] and Burl et al., teaches the use of numerous procedures with the Burl et al., device including: "any of a plurality of magnetic resonance imaging and spectroscopy sequences, such as echo-planar imaging, echo-volume imaging, gradient and spin-echo imaging, fast spin echo imaging and the like." [See **Burl et al.**, col. 4 lines 18-23] Therefore, It would have been obvious to one of ordinary skill in the art, at the time that the invention was made to modify the teaching of **Burl et al.**, to include SENSE MRI techniques because the type of imaging sequences for which SENSE is known to be usable, are producible by **Burl et al.**, apparatus.

49. Additionally, **Pruessmann et al.**, teaches and suggests that in conventional SENSE MRI methodology the reduction factor is bound by the number of coils used. [See page 953 col. 2 the first full paragraph], and that the geometry factor, (i.e. the arrangement of the coils around a patient, such as the arrangements shown on page 957 in Figure 3 of col. 1, and the phantom experiments section of page 957) of SENSE methodology allows the coil configuration to be freely optimized with respect to SNR, independently of coil and slice geometry. [See page 960 col. 1 paragraph 1 and page 960 col. 1 conclusion paragraph 1.] This teaching suggests that the used of a SENSE method results in an inherent reduction factor, related to the number of coils used or selected, and that the actual geometrical positioning of the coils is important, and also suggests applicant's limitation that the "selection and/or combination of the RF signals

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of at least two RF coils is in dependence on the desired SENSE reduction direction."

[See **Pruessmann et al.**, RESULTS page 957 col. 1 through page 958 col. 2].

50. It would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the geometrical arrangement of coils in the **Burl et al.**, apparatus would also have a "selection and/or combination of the RF signals of at least two RF coils is in dependence on the desired SENSE reduction direction", when implemented in a SENSE procedure, because the coil arrangements taught in col. 5 lines 23-49 of **Burl et al.**, suggest geometrical arrangements of two, four, or more combined coils based on the geometrical anatomy to be imaged, therefore if the **Burl et al.**, reference was modified to include the teachings of **Pruessmann et al.**, SENSE methodology the limitation of combining signals based on the desired SENSE reduction, for a specific portion of patient anatomy would fall within the scope of the **Burl et al.**, reference.

51. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) US patent 6,469,506 B1 issued October 22nd 2002, to **Felmlee et al.**, filed June 15th 2000 which shows multiple sets of two receiver coils in an MRI phased array coil where the signals from one coil or set are combined to form a single output image signal from the array of coils.

Conclusion

52. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-

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2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

53. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF

Diego Gutierrez

Supervisory Patent Examiner

February 24, 2004

Technology Center 2800